# CORRELATION BETWEEN AMOUNTS OF HOME STUDY AND CLASS MARKS

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Home study involves so many problems of child, school, and home that the difficulties of solution are baffling. However, a scientific study of the whole question is made urgent by the present confusion arising from (1) the home-study requirements of most American and European schools above the primary division; (2) the criticisms of many hygienists, psychologists, and administrators as to the quantity or quality of home study; and (3) the recent abolition of home-study requirements in a growing but still small number of American schools, generally with some increase, redistribution, or modified use of the study time in school. What is needed is some proof, rather than opinion or practice, on one side or the other. But such proof, of more than individual or local significance, is surrounded and conditioned by so many varying factors as to be almost inaccessible.

The November *School Review* published "A Study of Home Study," based upon records from 5,021 grammar- and high-school students in 25 schools or school systems in Virginia, as to the amount of time devoted in a typical week to the home preparation of school lessons. The care used to get accurate data was there explained in detail, and the results were interpreted without premature general conclusions. The present study carries the investigation one step farther and takes the risk of stating two tentative conclusions.

Though separate in itself, this study uses the previous home-study records from the 4 high schools with the largest representation, here amounting to a total of 1,299 records.—Charlottesville, Lynchburg, Richmond, and Roanoke. The other high-school records are not included on account of the unreliability of correlation results,

especially those of small degree, if only a few cases are represented. No group here studied has less than 57 students. Grammar-school records are not included on account of their various marking systems and symbols; but there is added to this report a rough comparison between the amounts of home study and the A, B, C marks of 2 Richmond schools.

An average of each student's marks was taken from the school report for the month in which the week's record of home study was made. Both the mark and the amount of home study for each student refer to practically the same school requirements, though, of course, the mark refers also to the work of 3 other weeks. As the marks were collected, without previous suggestion, months after the home-study records, there was no possibility of the former being influenced by a teacher's expectation of any use of them in comparison with the latter. These marks are probably based upon as accurate, or as inaccurate, grading of students' school work, as is the case in most schools of similar type. There is here no special defense of the marks used, but simply a belief that nearly 6,000 marks from over 100 teachers for 1,299 students in 4 schools are sufficiently serviceable to justify the general conclusions drawn from the 27 groups in the table.

The home-study records of 11 Charlottesville and 3 Roanoke students previously represented are here omitted, because the marks of these students were lacking in the school files. As 52 records from Lynchburg had to be omitted for this reason, the Lynchburg representation was further reduced by the omission of 13 records from students with 3 marks each and a home-study average of 500 minutes, and by the omission of 58 records with 5 (1 with 6) marks each and a home-study average of 564 minutes, thus leaving 254 records from students with 4 marks each and a home-study average of 443 minutes. The further reduction was made in order to test whether the resulting uniformity in marks, and presumably in studies, would decrease the deviations and correlations as compared with those in the 3 other schools. There is a far-from-general tendency for students, in comparison with their class averages, to study at home less or more according to whether they have less or more studies, without the result of a

corresponding variation in marks. The following figures from Table I are illustrative pro or con: of the 57 first-year students in Charlottesville with home study and mark averages respectively of 612 and 86, 21 with more than 4 marks averaged 607 and 86; of the third-year students in Lynchburg, 24 with 4 marks averaged 444 and 84, and 25 with 5 marks averaged 551 and 84; of the 101 third-year students in Richmond, with averages of 766 and 82, 6 with less than 5 marks averaged 761 and 81, and 19 with more than 5 marks averaged 784 and 79.

## DEVIATION

The large standard deviations from group averages of home study, as shown in the table, reveal a lack of school standards and control of the situation, even when allowance is made for uncontrollable variations in student, home, teacher, program, supervision, and subject. The quantity of home study is, of course, less important than the quality; but the time element should not and would not be so little regarded, if the school assigned its lessons more carefully and tested more closely the result of its assignments. Over and above its pedagogical significance, this time element is specially important in its influence upon hygienic development, domestic companionship, and social adaptation and recreation.

The deviations from class averages of home study ought to be smaller than those from school averages, because each class has its own requirements as to curriculum and program and possibly as to study, and is more homogeneous as to age, advancement, etc. The previous report for 13 high schools showed an increase in home-study averages from the first to the third year and a slight decrease in the fourth year below the third. It would seem that a combination of progressive class differences into a school average would naturally produce a larger deviation than those for the classes separately. But the classes here studied have standard deviations about equal to those of their respective schools. The average[1] of the 4 first-year deviations in home study is 84 per cent

[1] Of course, the average of group deviations is different from the deviation of a group combining the separate groups; but the former ought to be more valuable for our comparison than the latter.

TABLE I

| | Number Records | Average Minutes | Standard Deviation | Average Marks | Standard Deviation | Correlation Coefficient | Probable Error |
|---|---|---|---|---|---|---|---|
| Charlottesville— | | | | | | | |
| First year: total | 57 | 612 | 265.757 | 86 | 6.000 | .208 | .0889 |
| School: total | 155 | 687 | 318.308 | 87 | 5.292 | .109 | .0536 |
| Lynchburg— | | | | | | | |
| First year: boys | 54 | 344 | 174.697 | 81 | 8.888 | −.005 | .0918 |
| First year: girls | 81 | 514 | 235.268 | 82 | 7.746 | −.069 | .0750 |
| First year: total | 135 | 446 | 229.539 | 81 | 8.307 | −.034 | .0580 |
| Second year: total | 62 | 443 | 244.244 | 80 | 7.937 | .033 | .0856 |
| School: boys | 102 | 378 | 213.811 | 80 | 8.124 | .100 | .0980 |
| School: girls | 152 | 487 | 225.187 | 82 | 7.810 | −.039 | .0546 |
| School: total | 254 | 443 | 226.192 | 82 | 7.874 | .016 | .0423 |
| Richmond— | | | | | | | |
| First year: Latin | 108 | 515 | 206.930 | 85 | 6.000 | .006 | .0649 |
| First year: Latin—girls | 61 | 536 | 197.962 | 85 | 6.325 | −.095 | .0856 |
| First year: elective | 71 | 459 | 227.365 | 81 | 5.099 | −.113 | .0791 |
| First year: total | 264 | 479 | 205.920 | 82 | 6.245 | .088 | .0412 |
| Second year: Latin | 67 | 605 | 289.543 | 85 | 6.633 | .191 | .0794 |
| Second year: Latin (4 marks) | 58 | 633 | 297.738 | 84 | 6.708 | .212 | .0846 |
| Second year: boys | 74 | 472 | 226.164 | 80 | 6.000 | .002 | .0784 |
| Second year: girls | 97 | 635 | 306.176 | 83 | 6.164 | .122 | .0674 |
| Second year: total | 171 | 566 | 286.761 | 81 | 6.481 | .155 | .0504 |
| Third year: total | 101 | 766 | 302.200 | 82 | 5.657 | .048 | .0670 |
| Fourth year: total | 75 | 698 | 310.467 | 84 | 5.657 | .253 | .0729 |
| School: total | 611 | 577 | 282.301 | 82 | 6.083 | .136 | .0268 |
| Roanoke— | | | | | | | |
| First year: total | 129 | 567 | 267.302 | 85 | 5.745 | .374 | .0511 |
| Second year: total | 68 | 630 | 323.929 | 85 | 8.124 | .013 | .0817 |
| School: boys | 110 | 522 | 337.782 | 85 | 6.708 | .134 | .0631 |
| School: girls | 169 | 675 | 318.082 | 87 | 6.325 | .205 | .0497 |
| School: total | 279 | 615 | 326.928 | 86 | 6.557 | .160 | .0403 |
| Four Schools— | | | | | | | |
| Fourth year: total | 186 | 625 | 316.951 | 86 | 5.831 | .059 | .0493 |

of the corresponding average for the 4 schools, that of the 3 second-year deviations is 102 per cent of that for the 3 schools, and the third- and fourth-year deviations in Richmond are 107 and 110 per cent, respectively, of that for their school.

The home-study deviations are generally larger from larger averages, on account of the wider range of probable variations; but the percentages which the deviations make of the respective group averages from which they are calculated are more nearly constant and more suitable for comparison. For instance, the average of the deviations in the 4 first-year groups is 46 per cent of the average of the 4 first-year averages, while the average of the deviations in the 4 school groups is 50 per cent of the average of the 4 school averages. The corresponding percentages for the 3 second-year groups and the 3 school groups are 52 and 51; for the third and fourth years in Richmond and for the school total they are 44, 39, and 40. Even a cross-section of the 4 schools, made by combining all the fourth-year students into one group, gives a corresponding percentage of 51—about what might be expected in a single school or class. (The 8 omitted Lynchburg records for the fourth year are included in this group, to give a similar representation for Lynchburg as to variation in the number of studies taken by students.)

The great difference between boys and girls in home-study averages, which in the groups here compared are 35 per cent greater for the girls, differentiates the sex groups from each other and from the inclusive mixed groups. However, this fact does not decrease the deviation in home study in the sex groups as compared with the mixed groups. The average standard deviations for 2 school groups of boys and for 2 of girls, respectively, are 100 and 98 per cent of the corresponding average for the 2 school totals; and the average standard deviations for 2 class groups of boys and for 2 of girls, respectively, are 78 and 105 per cent of the corresponding average for the 2 class totals. Only in the class groups of boys is less deviation noticeable, and this is due to their small group averages. If we compare the percentages which standard deviations make of their group averages we have for the above mentioned school groups 61 per cent for the boys, 47 for the girls, and 52 for the

totals; and we have for the class groups 49 for the boys, 47 for the girls, and 51 for the totals.

Further still, in Richmond the first-year Latin and elective groups, respectively, have a standard deviation which is 105 per cent of that for the first-year total and a percentile deviation of 40 and 50 as compared with 46, in spite of the greater homogeneity of these subclass groups as to curricula, etc. These results are more noticeable because all the first-year students are equal in number of marks and presumably of studies, each student having 5. The second-year Latin group has a standard deviation which is 101 per cent of that for the second-year total, and a percentile deviation of 48 as compared with 51. Even if we confine this group to the 58 students having 5 marks each, the standard deviation is 104 per cent of that for the second-year total, and the percentile deviation is 47 as compared with 51. And, finally, the first-year Latin girls, the most homogeneous group here studied, have a standard deviation which is 96 per cent of that for the first-year Latin total and a percentile deviation of 37 as compared with 40.

However much we have divided students into groups with more and more elements of homogeneity, we can make little substantial reduction in the standard deviation from the group averages for home study.[1] The greater homogeneity as to curricula, program, advancement, sex, etc., has little influence upon deviations in amount of home study. The standard deviations in the smaller groups should really be a little larger than those here given—for instance, 2 more in each of the 4 smallest class groups—if we use a modified formula for small groups.

The elimination of 71 records from Lynchburg, so as to make all the students here included have 4 and only 4 marks, does not reduce its group deviations in comparison with those of the 3 other schools. The average standard deviation for the first year in Lynchburg is 51 per cent of the first-year average, while the corresponding percentages for the 3 other first-year groups are 43, 43, and 47; the percentages for the second year in Lynchburg and for the 2 other

[1] The previous report included a study of average and of standard deviations from school averages and medians; and now it is seen that the disproportionate class representation in the different schools did not seriously reduce the significance of the results.

second-year groups are 55, 51, and 51; the percentages for the Lynchburg total and for the 3 other totals are 51, 46, 49, and 53.

The following figures emphasize the practical significance of the variations in amount of home study for the week, and, if divided by 5, in average time spent in the home preparation of lessons for each school day. The figures are based (1) upon the average of the group averages and (2) upon the probable error calculated by means of the average of the standard deviations from these group averages. The average amount of home study for the 4 first-year classes is 8 hours and 41 minutes, but about half of the students study at home less than 5 hours and 29 minutes, or more than 11 hours and 53 minutes; the average for the 3 second-year classes is 9 hours and 6 minutes, but about half of the students study at home less than 5 hours and 54 minutes, or more than 12 hours and 18 minutes; the average for the 2 class groups of boys is 6 hours and 48 minutes, but about half of the students study at home less than 4 hours and 33 minutes, or more than 9 hours and 3 minutes; the average for the 2 class groups of girls is 9 hours and 34 minutes, but about half of the students study at home less than 7 hours and 31 minutes, or more than 11 hours and 37 minutes; the average for 3 Richmond subclass groups is 8 hours and 46 minutes, but about half of the students study at home less than 6 hours and 18 minutes, or more than 11 hours and 14 minutes; the average for the 4 schools is 9 hours and 40 minutes, but about half of the students study at home less than 6 hours and 25 minutes, or more than 12 hours and 55 minutes.

The average for the 13 high schools in the previous report was 10 hours and 37 minutes, but about half of the students study at home less than 7 hours and 18 minutes, or more than 13 hours and 54 minutes. Furthermore, the average for the lowest 10 per cent of the students in each of these 13 high schools was 65 per cent, or 6 hours and 55 minutes, below the average of 10 hours and 36 minutes; and the average for the highest 10 per cent was 93 per cent, or 9 hours and 53 minutes, above that average. The averages of the lowest and the highest 10 per cent in the 4 schools here represented (3 with slightly different averages) were respectively 68 per cent, or 6 hours and 41 minutes, below, and 105

per cent, or 10 hours and 16 minutes, above the average of 9 hours and 46 minutes for the 4 schools.

Before correlation is discussed, a comparison should be made between the deviations in home study and those in marks. The mark deviations in the more homogeneous groups are also similar to those in the less homogeneous groups; but this similarity is not as noticeable as in the case of home study, because there is less range possible in marks, the group averages are more nearly alike, and the class averages do not progress uniformly from year to year. If any definite influence of home study upon school work is assumed, and such influence is generally assumed where home study is required, then the deviation from the home-study average ought to be reflected in the deviation from the mark average in the same group. But this does not seem to be the fact. Though deviations in minutes of home study on a scale of more than one thousand cannot be directly compared with deviations in marks on a scale of one hundred, we can compare the respective percentages which each deviation in the same group makes of the group average from which it is calculated. For instance, in the first year in Charlottesville the standard deviation in home study is 43 per cent of the home-study average, and the standard deviation in marks is 7 per cent of the mark average; in the first year in Lynchburg the percentages are 51 and 10 respectively, in Richmond 43 and 8, in Roanoke 47 and 7. In the second year the percentages are 55 and 10, 51 and 8, 51 and 10; in the 2 class groups of boys and the 2 of girls, 51 and 11, 48 and 7, 46 and 9, 48 and 7; in the 3 Richmond subclass groups, 50 and 6, 40 and 7, 48 and 8; in the 4 schools, 46 and 6, 51 and 10, 49 and 7, 53 and 8. The average of the percentages in the case of home study is 6 times the average of the percentages in the case of marks. This great difference in the deviations shows that both cannot represent actual variations in school work, even when allowance is made for other influences which may reduce the correspondence between the two deviations.

Until school administrators and teachers reduce the deviations from class and subclass averages of home study, they can claim little knowledge or control of the situation. And, whether right or wrong in itself, the abolition of home study may be no solution of

home-study problems, but may be adopted in a given system as a way of dodging rather than solving these problems. An objection might be raised that the deviations in the schools here studied are not typical of the better American schools; but it is very improbable that these 4 superior schools show an unusual inferiority in home-study control.

Some high schools have time requirements for home study, which are easy to make but difficult to put into practice, especially in departmental systems. It is yet to be proved how much the deviations are decreased thereby. In fact it is difficult for schools to know what their home-study averages and deviations really are, as occasional questionings or questionnaires issued by teachers or principals do not generally collect accurate data about home study. Students, and probably their parents, fear that their answers to such questions may influence the school judgment of them or their work, and consequently there is a tendency to study more in expectation or to exaggerate in retrospect, so as to make a creditable showing; student calculations, however conscientious, are usually inaccurate as to the amount of time spent in home study, especially as to a general average; chance variations tend to vitiate the data given for one day or for one subject; most officials are unable or disinclined to interpret the variables in home-study data according to the necessary statistical methods, and even an elaborate and tedious amount of statistical work will produce only suggestive rather than exact conclusions. Yet the difficulties must, in an efficient educational system, be overcome sooner or later.

## FIRST CONCLUSION

*Measurement and treatment of individual variations in amount of home study.*—The first tentative conclusion of this study can now be stated as follows: If in a given class or subclass a fairly accurate average of the usual amount of home study per week or per day and the individual deviations therefrom can be found by continued test and conference or by expert diagnosis, then some calculations (preferably but not necessarily the standard deviation and the probable error) should be made in order to find out the amount of deviation and then the probable limits above and below the

class average which divide the 50 per cent of students with less deviation from the 50 per cent with more deviation. In large groups the median should be used rather than the average. (See the previous report.) The half of the class which shows the greater deviation should then receive additional and individual treatment as to test, consultation with child and home, supervision of school study, stimulation, reclassification, etc., in order to reduce the individual deviations—due to variations in child, home, teacher, program, supervision, or subject—to amounts within the limits of the deviations of the other half of the class, i.e., the probable error. Although individuals in the latter half may need the treatment suggested above, the general procedure should begin with the former half. With low class averages the greater deviations below the average need more attention than equal deviations above it, and with high class averages the greater deviations above need more attention than equal deviations below; in the first case deviations below may imply neglect, in the second case deviations above may imply strain. As any change in deviation may produce a change in class average, the reductions suggested may produce such a different class average that new studies will be made necessary from time to time. If at any time the class average is found to be too low for the desired efficiency in class work or for other educational aims, or is found to be too high for the health or the family and social life of as many as one-fourth of the class, a preferred average can be set and explained to the class, and the deviation and probable error can be calculated from that average, or an entirely new study can be made for this purpose. It would be wiser in most cases to make several such studies, with the subsequent treatment, before deciding upon a standard average amount of home study for the class. This average would be far more valuable than a time requirement based upon guesses or arbitrary criteria.

In these studies the deviation considered satisfactory for a class or subclass should not be graded on an absolute scale, but only in proportion to the amount of the class or subclass average—in other words, as some percentage of that average. The standard deviation should not exceed 25 per cent, and should be kept as much less as possible, though with constant regard for the inevitable and

even healthful variations within a class. This maximum means that a class with an average of 8 hours and 20 minutes per week would have a standard deviation not over 2 hours and 5 minutes, and also that the 50 per cent of students with the greater deviation would study at home less than 6 hours and 56 minutes or more than 9 hours and 44 minutes. A 10 per cent standard deviation from this average would be only 50 minutes, and the probable error only 34 minutes.

CORRELATION

The present study is concerned more with correlation between amounts of home study and class marks than with the deviation from home-study averages, though the two problems are closely related. Before the correlation figures are discussed, it may be well to illustrate in part their significance in this study. In a given class of students, some may study at home less than the average time for the class and receive less than the average mark for the class (positive correlation); some may study at home more than the average amount and receive more than the average mark (positive correlation); some may study at home less than the average amount and receive more than average mark (negative correlation); and some may study at home more than the average amount and receive less than average mark (negative correlation). Furthermore, in each of these fractional groups, some students may vary more than the other students from the home-study average or the mark average or both of the averages of the class, and may therefore have a greater positive or negative correlation, according to the nature of the correlation of their fractional group. But what correlation is there in the class as a whole? Because the correlation of one student or of any part of the class cannot be fully representative for the class as a whole, the answer to this question has to combine all the individual correlations into a statistical expression for the group. These coefficients, as percentages of complete positive or negative correlation, range from 0 to +1 or from 0 to −1. The probable error of the coefficient for any group is the range of probable variation of half of the group above or below the coefficient, the other half varying beyond these limits. For instance, in the first year in Charlottesville the correlation is +0.208, but

about half of the students have a correlation below +0.119 or above +0.297; in the first year in Lynchburg the correlation is −0.034, but about half of the students have a negative correlation greater than −0.092, or a positive correlation greater than +0.024. In the second illustration especially the range of variation of the individual correlations within the class is so great in comparison with the coefficient for the class as a whole as to render the coefficient uncertain and therefore of little value by itself.

The main dangers in correlation statistics in studies like the present one are (1) that so many different elements may be combined in one group that the number or degree of extraneous influences may decrease or increase, respectively, the correlation coefficient below or above the actual correlation existing between amounts of home study and class marks; and furthermore (2) that any correlation may be considered as necessarily expressing a positive or a negative causal relationship between amounts of home study and class marks, whereas a positive correlation may also be due in part or even in whole to one or more extraneous influences upon both series, or separate influences upon each, in somewhat the same direction, or a negative correlation may also be due in part or even in whole to one or more extraneous influences upon both series, or separate influences upon each, in somewhat opposite directions.

Consideration of these dangers has led the author to divide his data into groups of more and more homogeneity as to curricula, program, age, advancement, sex, etc., in an effort to reduce thereby the number or degree of differentiating influences upon amounts of home study and, to a less degree, upon class marks. The greater the number of these influences the less probably would be the degree of correlation, because there would be more possibilities of these influences acting upon one or both series in different than in the same direction. But actually the more homogeneous groups do not seem to have a smaller number or degree of differentiating influences upon one or both series, as is shown by the fact that the standard deviations in both series are about the same in the more homogeneous as compared with the less homogeneous groups. And if similar deviations in class groups, for instance, as compared

with those of school groups, are due to a similar number or degree of these influences, there will probably be a similarity between the class groups and the school groups in their respective correlations between amounts of home study and class marks. For we have no right a priori to suppose that the differentiating influences would decrease or increase the correlations in the class groups any more or less than the differentiating influences would decrease or increase the correlations in the school groups. This does not mean that single groups would not differ from each other in degree of correlation and differ disproportionately to their respective deviations, but that in the long run similar group deviations would tend to produce similar group correlations between amounts of home study and class marks, if other conditions remained unchanged.

As a whole, the table does not show greater correlation in the more homogeneous as compared with the less homogeneous groups. The average[1] of the 4 first-year correlations is 0.159 (P.E. 0.0598), while the average of the 4 school correlations is 0.105 (P.E. 0.0407); the average of the 3 second-year correlations is 0.067 (P.E. 0.0695), while the average of the 3 school correlations is 0.104 (P.E. 0.0365); the averages of the correlations of 2 school groups of boys and 2 of girls, respectively, are 0.117 (P.E. 0.0805) and 0.083 (P.E. 0.0521), while the average of the 2 school correlations is 0.088 (P.E. 0.0143); the averages of the correlations of 2 class groups of boys and 2 of girls, respectively, are −0.001 (P.E. 0.0851) and −0.026 (P.E. 0.0712), while the average of the 2 class correlations is 0.060 (P.E. 0.0542); the average of the 3 subclass correlations in Richmond is 0.028 (P.E. 0.0745), while the average of the 2 class correlations is 0.121 (P.E. 0.0548). Most of the more homogeneous groups have smaller coefficients than do the less homogeneous groups.

The practical meaning of the smallness of the correlations is further emphasized by the following figures. As most of the coefficients and many of the groups are small enough to make large

[1] Of course, an average of group correlations is different from the correlation of a group combining the separate groups; but the former ought to be more valuable for our comparison than the latter. An average of probable errors suffers more than an average of correlations from being out of relation to the number of cases involved.

probable errors in comparison with the coefficients, it will be well to interpret the correlations in terms of the probable limits below and above the respective coefficients, which include one-half of the students of each group, the other half varying below and above these limits. For the following illustrations the three highest and the three lowest correlations are used: the first year in Roanoke, from 0.323 to 0.425; the fourth year in Richmond, from 0.180 to 0.326; the second-year Latin in Richmond, with 5 marks for each student, from 0.127 to 0.297; the first-year girls in Lynchburg, from −0.144 to +0.006; the first-year Latin girls in Richmond, from −0.181 to −0.009; the first-year elective in Richmond, from −0.192 to −0.034. It is noticeable that these extremes are all for class and subclass groups. The average 0.084 (P.E. 0.0656) for all the 27 groups in the table include so many different elements and so many students more than once that it has little definite value, but it shows the tendency of the correlations.

Furthermore, the small positive coefficients are not the result of a few extreme negative correlations which pull down the positive correlation for each group but do not really represent the group as a whole. They are the result of a surprisingly large proportion of individual negative correlations. The number and percentage of the positive, negative, and zero correlations in each group have been computed. The following percentages are for the 3 groups with the highest and the 3 groups with the lowest percentage of individual positive correlations: the first year in Roanoke, 64, 31, and 5; the fourth year in Richmond, 63, 29, and 8; the second-year girls in Richmond, 59, 34, and 7; the school group of girls in Lynchburg, 43, 50, and 7; the first year in Lynchburg, 43, 54, and 3; the first-year girls in Lynchburg, 40, 53, and 7. The average percentages for all the 27 groups are 51, 43, and 6. There is an irreducible minimum of uncontrollable variations in child, home, teacher, program, supervision, subject, or marks, which put some students behind in marks, even though they study at home more than the average amount, and other students ahead in marks, even though they study at home less than the average amount. But this irreducible minimum ought not to affect as many of the students as it does.

The significance of these figures is increased by the result of a rough calculation with the A, B, C marks of the fifth, sixth, and seventh grades in two Richmond grammar schools. These marks were given for class work as a whole and not for the subjects separately. Of 149 students from school B, 60 per cent of the 40 students with A studied at home less and 40 per cent studied more than the class-average amount; 58 per cent of the 80 students with B studied at home less and 42 per cent more than the class-average amount; 56 per cent of the 21 students with C studied at home less and 44 per cent more than the class-average amount. For 147 students from school F, the corresponding percentages are as follows: of the 37 students with A, 62 and 38; of the 96 students with B, 50 and 50; of the 14 students with C, 50 and 50. For 296 students from schools B and F, the corresponding percentages are as follows: for the 67 students with A, 54 and 46; for the 176 students with B, 53 and 47; for the 53 students with C, 53 and 47. Of the 85 students in school B, who studied at home less than the average amount, 21 per cent received A, 54 per cent received B, and 25 per cent received C; of the 64 students who studied at home more than the average amount, 19 per cent received A, 53 per cent received B, and 28 per cent received C. The corresponding percentages for school F are as follows: for the 78 students who studied at home less than the average amount, 29, 62, and 9; for the 69 students who studied at home more than the average amount, 20, 70, and 10. The corresponding percentages for the schools B and F are as follows: for the 163 students who studied at home less than the average amount, 25, 58, and 17; for the 133 students who studied at home more than the average amount, 19, 62, and 19. The marks do not reflect the minus or plus deviations in home study, or vice versa.

What is the minimum positive correlation between amounts of home study and class marks necessary to justify home study? For the following among many reasons no definite answer can be given. Home study must be judged by its quality as well as by its quantity; a correlation between amounts of home study and class marks does not necessarily express the influence of those amounts upon class work; this influence is the most generally

accepted but not the only purpose of home study; this influence is but one of several influences upon class work; the marks may not express an accurate grading of class work and indirectly of the amount of these several influences upon it; deviations in home study and in class marks interfere with the calculation of an accurate correlation between them; general conclusions for a group will not apply to many individuals in that group; different communities, schools, grades, teachers, subjects, topics, methods, etc., may need different correlations to justify home study. However, the minimum for a group as a whole, especially for a class or subclass, should probably be not less than 0.20 with a probable error of not more than 0.08. As only 5 of the 27 groups here studied are above this minimum, as 3 out of the 5 are very little above it, as 6 out of the 27 have negative correlations, and as the average for the 27 groups is less than 0.09, with a probable error above 0.06, the general defense of home study is far from strong in these schools. There is as yet no evidence that this defense is stronger in other schools.

SECOND CONCLUSION

*A statistical proof or disproof of the value of home-study practice.*——The second tentative conclusion of this study can be stated as follows: Each phase of the home-study tradition so prevalent in our schools must be scientifically defended or given up. The difficulties in thus defending, modifying, or even abolishing home study are but reflections of the inevitable difficulties of the science of education. In spite of the limitations suggested in the preceding paragraph, studies of the correlation between amounts of home study and class marks are among the most fruitful lines of research to this end. (But the quality and the other purposes of home study, to be discussed later, must not be overlooked.) Such studies can be made as extensions of those suggested in regard to deviation. If deviation is decreased and other elements are practically unchanged, an increase in correlation can be expected though not definitely predicted. Furthermore, some clearly defined change of general application to the class should be made in the marking system, home-study requirements, methods of assignment, class tests, supervision of school study, or some other element of the

situation; and after this new arrangement is sufficiently established in practice to exert its influence, a study should be undertaken to measure the effect upon correlation. It would be preferable to make only one important change before each study, so as to prevent confusion of interpretation. Under expert guidance a series of such studies would reveal the sources of strength and of weakness in both the home-study practice and the marking system, and would lead to administrative efforts to increase the strength and decrease the weakness in both.

In these studies a correlation coefficient above 0.20, with a probable error below 0.08, might be considered a minimal justification of home study. The justification would tend to increase proportionately with an increase in the coefficient or a comparative decrease in the probable error. This minimum means that in a class with a home-study average of 8 hours and 20 minutes and a mark average of 85, an increase to 9 hours and 10 minutes could thus be correlated with a mark of 86.70, but 50 per cent of the class would have marks less than 86.02 or more than 87.38; or a decrease to 7 hours and 30 minutes could thus be correlated with a mark of 83.30, but 50 per cent of the class would have marks less than 82.62 or more than 83.98. Theoretically this minimum also means that an increase of 10 per cent in marks could thus be correlated with an increase of 2 per cent in home study, or a decrease of 10 per cent in marks with a decrease of 2 per cent in home study.[1]

[1] So far as he is able and has the spare time, the author will be glad to answer inquiries from specific schools or school systems regarding studies of home study in relation to school hygiene and family life. His *Bibliography and Source Book on Home Study* will be finished next fall. In the meantime he will greatly appreciate any data or opinion on home-study requirements or conditions.